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The Danger of a Single Story: A Critical and Holistic Account of Rachel's Experience in Computing for Broadening Participation

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The Danger of a Single Story: A Critical and Holistic Account of Rachel's Experience in Computing for Broadening Participation

"Stories matter. Many stories matter. Stories have been used to dispossess and to malign, but stories can also be used to empower and to humanize."

-Chimamanda Ngozi Adichie, 2009

Prologue by lead author

Stories have always been a big part of my life. I love reading story books, as demonstrated by the collection of comics, teen novels and now, education-related books I own. I have loved not only the stories I read in books but also the stories I heard while growing up in India from my maternal grandmother. Though I had heard her story many times, I would listen to it attentively. Her experiences have guided and shaped me into who I am today. After graduating as an engineer and becoming a software developer in a multi-national corporate in India, I caught the American Visa fever because of the stories I heard from my peers and colleagues. Luckily, I had the chance to move to the US after my wedding and so I moved to the US in 2017. But the political situation when I arrived made me realize that the American life is not always what is portrayed in India. In the beginning of 2019, I had to move to Kenya, to support my spouse with his research. I thought Kenya would be mostly desert and hunting-based culture with no Indian grocery/food available like in the US. To my surprise, Kenya is a beautiful country and has a large Indian population, with a lot of Indian grocery stores and restaurants. Indians have also been recognized officially as a Kenyan Tribe. My neighbors were lovely, and we even had a big garden to grow our own produce. I consider Kenya my second home now.

In Chimamanda Adichie's TED talk [1], she discusses the dangers of a single, and one-dimensional, story. This concept helped me reflect on the ways my travels opened more complex stories about the places I traveled to. There were simple stories that influenced my ideas of the United States and Kenya before I traveled and experienced them personally. Now those stories have been replaced by more holistic and complex stories through lived experience.

When I started a Ph.D. in engineering and computing education in 2021, and started reading the literature, I saw different stories being told about women in computing. Some scholars told deficit stories from self-efficacy and sense of belonging perspectives, others told asset stories from persistence and challenges within computing perspectives. While the literature tends to prioritize asset stories as the most important to tell, I have come to believe that both asset and deficit stories can create harm for how we think of students and learning environments. A deficit-based framing comes from the inequities within computing. For instance, women not possessing certain qualities to pursue computer science when they are compared in a system created for and by men. An asset-based framing maps on to the assets possessed by women and glorifies their resilience and persistence in computing when we should be thinking about why they must struggle so much to persist in the first place. This in turn, creates a toxic positivity mentality that women can achieve in spite of the odds they face within a field. However, both stories are told

through a single lens or dimension, and thus they do not convey the holistic reality of these participants' storied lives. In this paper, I will retell a single participant's story in three different ways to consider the dangers and potential that come up when choosing to tell one story version or another. I will explore how the choices we make in which story to tell as scholars can help understand our participants' experience and perspective within computing in more nuanced ways. Stories matter, which stories we tell matter. I hope this paper opens up consideration of the stories we tell as scholars and helps move us towards more critical and nuanced modes of representing our participants.

The Danger of a Single Story

In her TED talk, Adichie describes how western media project the narrative of African countries. As a child, Adichie read many American and British books where the characters drank ginger beers, talked about the weather, and had snow, which wasn't typical in a country like Nigeria. These books opened new worlds for Adichie as a kid and her imagination of how these countries looked like. But as she grew up and discovered African books, she related more to them and recognized herself in them. When she came to the US to attend university, her roommate was shocked by Adichie's English-speaking skills and her Mariah Carey tapes. Adichie later learned that her roommates' "well-meaning pity" was based on how Africa was being projected in the US as a single story of catastrophe.

Adichie argues that a single story "shows a people as one thing, as only one thing, over and over again, and that is what they become." She further continues to describe how the narrative, a single story, contends within power relations. A person with power can make a story the definitive story of a person, a community, or a country. Adichie emphasizes that the dominant narrative, the single story, robs that person, community, or country of its dignity. Similarly, in education, scholars, educators, and leaders (i.e., the people who have significant power to tell the story) dictate that a person is successful or respectable if their path leads to narrowly defined destinations. We label a student persistent if they stay on their path to the destination despite the odds and struggles, they face. If they reach their destination, we call them successful. When a student leaves the path that they chose, we label the student has failed and label that they might not have the strength to complete the undergraduate degree. The strengths and capital possessed by the students while navigating their path toward their destination are labeled assets. The mistakes made while learning to survive in a newer learning environment are labeled deficits. We, as researchers, must try to see beyond these labels and bring out the reality of students' lives in education.

Literature Review: Stories about Broadening Participation of Women in Computing

There has been a decline in the graduation rate of women in the computing fields since 1984 [2]. Calls to broaden the participation women have corresponded to funding initiatives, such as the National Science Foundation's (NSF) Broadening Participation in Computing (BPC) program [3]. As the scholarly community takes up these calls and justifies their work, they tell stories about the problem, the solution, and most importantly, the people involved with broadening

participation. Here we review some of those stories as represented by major trends in scholarly literature.

Some stories on broadening participation of women in computing come from primarily quantitative research that highlights factors influencing the participation (or retention, persistence) such as sense of belonging, and self-efficacy [4]–[7]. Margolis & Fisher [8] found that primary factor that influences the participation of women in computing is stereotyping the computing majors as "geeks/nerds" (obsessed with computing), which is attributed to male orientation and success. Main & Schimpf [6] conducted a literature review on women's underrepresentation in computing fields and found that the women's underrepresentation in computing degrees is also due to unwelcome classroom environments, stereotyping qualities, and reduced their sense of belonging. These factors have found to significantly impact women's sense of belonging in computing [4]. The cultivation of an unwelcome learning environments in computing affecting women's sense of belonging have made them to lose interests in pursuing a degree in computing [4], [5], [7], [9]. The self-efficacy of women in computing is also linked to their sense of belonging in the learning and workplace environments [10], [11], which is another important factor for participation and persistence. Social persuasion has been a substantial factor in influencing the self-efficacy in both men and women, from around the world [12]. Galpin [12] highlights that women's self-efficacy differed with cultural backgrounds and individual experiences. In contrast, Varma [13] argues that the decrease in the participation of women in computing is specific to the U.S., while other countries like India, Malaysia, etc., show an increase in the enrollment of women in computing courses. In India, women feel confident about their math and computing skills compared to their counterparts in the U.S.[14].

These different stories highlight various factors affecting women's participation with respect to self-efficacy, and sense of belonging within computing and help us provide a more welcoming, supportive environments to women in computing. These stories imply that there are institutional factors, for instance, unwelcome learning environments as the reason, however, there have been little effort to understand the interaction between a student and these institutional factors. For instance, we have lack of understanding about how other peers interact with women in computing. Hence, a more holistic understanding of the external societal and cultural factors impacting the women's participation within computing is underexplored, which is also indicated in their systematic literature review by Pantic & Clarke-Midura [7].

Most of the stories pointing out the factors influencing this underrepresentation come from a deficit-based perspective; for example, women possess lower computer self-efficacy [6], [8]. While moving away from these deficit-based perspectives, we move into asset-based perspectives using the community cultural wealth framework (CCW, [15]) to understand the assets (capitals) possessed by marginalized communities (for example: [16], [17]). Though less in number, these asset-based works are primarily qualitative and record the experiences of the participants. Thus, providing a better understanding of the participant stories.

Rodriguez et al [17] studied the CCW of Latina undergraduate women in computing and found that some of them had to get support through their peers or family members to support with certain skills (e.g.: homework challenges) to navigate within their computing degree. These challenges activate their access to cultural capitals such as social capital and familial capitals.

Similarly, Jaumot-Pascaul et al's [16] qualitative meta-synthesis of women of color's (WOC) cultural capitals were activated by their experiences within computing, for instance, motivation to pursue graduate school activates aspirational capital. These stories are inspiring and record the challenges faced in their learning environments and recommend the inequities within computing to change. These stories also offer us a view of the resilience and persistence possessed by the participants within computing. However, there is little understanding of what the pressure to persist and become role-models for future women might look like for these participants. These stories might imply that the onus to succeed and persist in the computing degree is on themselves rather than challenging the systemic/institutional inequities within the department. Thus, we find limitations with both the assets and the deficits single stories, and we find a lack of a holistic, well-rounded stories for what it means to be a woman in computing.

In this study, we attempt to tell similar stories about the assets (personal strengths) and deficits (personal weaknesses) that the participant spoke about and that seem consequential for her participation in computing. We also attempt to tell a balanced and nuanced story that integrates a sense of the participant's broader context beyond their individual factors. Contexts such as out-of-school experiences and interactions with family and friends are frequently overlooked in the literature because the quantitative approach to assessing factors for persistence in computing degrees tends to take a positivistic and individualistic lens that homogenizes contexts in pursuit of generalizability.

Data Collection and Context

Rachel is a Hispanic woman pursuing an undergraduate degree in Computer Science at Southeastern Public University (SPU), a Hispanic Serving Institution in the Southeastern United States. She is one of the participants admitted into a Scholarship and Support Program (SSP), an NSF S-STEM [18] program at SPU, launched in September 2021 as a collaborative scholarship and educational research effort at three public research universities in the Southeast United States. The program is designed to support lower-income students pursuing a degree in a computing field, including computer science, information technology, cybersecurity, and computer engineering, through scholarship and a variety of co-curricular activities, including a mentored-career pathway experience that reflects their interests. We interviewed Rachel twice, in Fall 2021 and again in Spring 2022. Our first interview in Fall 2021 was conducted at SPU, where we interviewed all 16 participants in the first cohort. The first interview protocol was semi-structured and focused on the three different pathways offered by the program and their perceptions of them: graduate school pathways/research, professional pathways/internships, and entrepreneurship pathways. Rachel was one of the 16 interview participants, and her interview stood out to us because of a strong impression of lacking self-efficacy and being worried about her future career pathway. The lead author was the primary interviewer and followed up with Rachel and two other women from the cohort in Spring 2022 to understand women's experiences in computing. In the follow-up interview, our protocol focused on the participants' experiences that led them to pursue a computing degree and their current experiences as an undergraduate woman in computing. The first and second interviews were conducted on Zoom, and they lasted for 50 and 57 minutes respectively. Then the Zoom audio recordings were transcribed verbatim.

During the first interview in the Fall of 2021, the lead author was the interviewer, and two other researchers were present. One of the additional attendees is the second author and an assistant professor (in engineering and computing education); the other attendee is a part-time Ph.D. student, Co-PI on the S-STEM research grant, and a Teaching professor in the computer science department. This, somewhat larger than the typical group, was assembled to help train the first author and part-time Ph.D. student. In between the first and second interviews, the lead author and the participant established rapport with each other while meeting each other during other program activities and events, which the first author attended and took field notes. The second interview was one-on-one, deeper, and more emotional.

Data Analysis and Analytical Framework

Utilizing a discourse analysis methodology [19], [20], we focused simultaneously on the textual content, the implicit positioning, the participant-researcher interaction, and the broader context for the two interviews. The first author open-coded significant passages and events and then presented it to the second author, her advisor and research mentor. Then, through iterative refinement of hypotheses [21] both authors read the transcripts and discussed agreed on analysis claims regarding the tone, interaction contexts, interview rapport, and self-positioning of the participant. Our focus on contrasting deficit and asset stories emerged from considering the ways the interview content resonated with familiar stories in engineering and computing education. As we arrived at the title inspired by Adichie's TED Talk, we focused on analytical commentary on the possible dangers and benefits of our own narrative constructions to place these familiar stories into critical scrutiny. For this paper, we constructed and analyzed the narratives by providing direct quotes from Rachel and adding our own narrator commentary, in a similar procedure outlined by Kellam et al. [22].

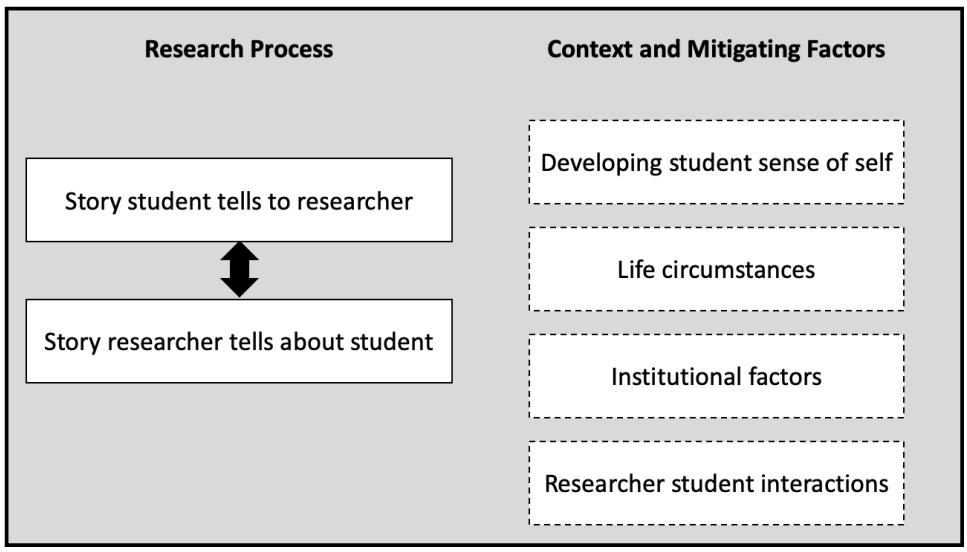

Figure 1. Our Analytical Framework

As we analyzed the interview transcripts, we noticed it was possible to construct multiple possible narratives, depending on the source and context that is considered. We developed an analytical framework (Figure 1) to help us clarify the multiple possible stories and contextual factors at play. We noticed it was possible to construct multiple possible narratives, depending on the source and context that is considered. Hence, we take different positions as authors while constructing each narrative to make the readers understand the differences in each narrative. For instance, we take the perspective that Rachel has perceived deficits in the first narrative, while we focus only on her assets in the second narrative.

In Figure 1, we note that the research process in general includes a story a student tells a researcher. This story may be through a recorded interview, as in the case of this study, or in another format. A response to a survey is also an expression of a story, as each specific statement a person may be asked to Agree/Disagree with, or to rate on a Likert scale, is an expression of the reality the student perceives.

In general, the story a researcher tells about a student tends to draw directly on that story the student tells the researcher. That student's story is in many cases richer and more complex than the researcher has the capacity to tell, so much of the work of research is about collating and synthesizing student stories down to a more concise and precise format. For different types of research this problem of scale and the need to synthesize can be more or less or extreme. If there are 50 participants in a study, then experiences need to be synthesized significantly. In this study, with a single participant, we became particularly aware of the complexity in the student's story and the choices we make as researchers when choosing to tell one particular story.

The story a student tells a researcher is often mitigated by other context and factors. Students develop over time and continue to tell, retell, and contextualize their stories, to themselves and to others, with new understandings. Students also experience actual life changes and growth, such that a student who initially expressed a lack of self-confidence could have had experiences that have boosted their confidence. Some of these changes could be related to institutional factors and intentional actions of programs or instructors since the goal of many programs is to impact and support students. The interaction between participant and researcher is also at play, where initial perceptions give way to a developing rapport and each moment of an interaction can impact the way future actions play out and are perceived.

Within this complex landscape, we note that a researcher rarely has the complete information about the context and mitigating factors involved in their research, and we each can only do the best we can with the information provided by a student or by our other knowledge and methods of data collection. This paper is an exploration of the stories we can tell given our inevitably limited information and the possible dangers of simplification.

Findings

In the sections below we present three stories about Rachel. The first two stories are intentionally limited by focusing on specific data content (primarily the first or second interview) and by a particular type of scholarly story that content can convey (deficit/fears or asset/strength). The

third story is an attempt at a more holistic account that balances some of the truths contained in the prior two stories.

A story about Rachel's fears for the future

In Rachel's first interview, she gave an impression of a woman who lacks confidence about her skills and abilities to succeed in computing in the future. At the time of these interviews, she was a recently transferred sophomore and had just started classes on campus after the COVID-19 disruption with in-person classes. Within this interview, Rachel frequently described herself as has having limited knowledge. For example, when asked how she would describe her abilities as a computer science student, she responded by saying,

> *I feel like I've been in school for much too long and I have too few classes, too little knowledge under my belt to actually say that I know anything. The social games like all the hoops and loops and things that we need to jump through to get interviews or mainly it's like how do you get a job? You need to have projects, okay, how do you get projects if you need money and you don't have time? Well, you work and then you don't have time to do projects, and then studying is difficult and then school takes up a lot of your time.*

The phrasing "too little knowledge...to...say that I know anything" comes across as a dramatic pronouncement. As a community college transfer student who is significantly older than her peers, Rachel feels that she has been in school for "much too long" and does not feel like she has much useful knowledge. In this interview focused on Rachel's future, her negative self-assessment is an indication of the internal pressure she puts on herself that comes up when thinking of her life after graduation. Her quote indicates a series of accumulating milestones Rachel perceives to attain a career after graduation. The way her to-do list accumulates (to get a job you need projects; to get a project, you need money, etc.) indicates a logical flow that is a source of stress while the sense that she lacks all of these prerequisite items (money, time, and resources) helps explain her feelings of inadequacy and being stuck. Although she is still in school, she expresses being behind regarding expectations for an undergraduate computing student. Pursuing an undergraduate degree makes it difficult to even think about these many aspects of her career progression.

This self-doubt/lack of self-confidence came up other times, for instance, when she was asked what her plan after graduation was:

> *I need to continue studying because I don't feel prepared for life, I don't feel that I have the resources or the awareness of how to learn things on my own yet, as in I don't have the foundations for learning other things...*
>
> *[contd] I don't even know how to get into one of those [Ph.D.] programs. And my GPA isn't the best. I don't have the best track record and research. I haven't-- I'm not a primary author in any research papers, I haven't done anything fantastic. So acceptance into any of the good schools [is] kind of like, not possible at this moment in time. Another option is masters and then PhDs, I would like to ultimately get a chance to work within*

> *the research departments of like Nvidia, or Intel, or [other] cool stuff. I don't know anything about it.*

When asked about her future, Rachel brings up her self-doubts and lack of self-confidence. Rachel says that she "doesn't feel prepared for life" after graduation, and she reiterates that she doesn't "know anything" about career paths of interest. She fears she will complete her undergraduate degree and not be able to land a job or even have a clear plan to get one. She also fears that her GPA "isn't the best" and "don't have the best track record" in research to get into graduate school. This self-doubt and lack of self-confidence is partly due to a comparison to the role models she follows outside of school, as she notes:

> *Most of the people that I follow online, one of them, Lex Friedman; he has a podcast, most of these people are [like] Andrew [Huberman, and] they all have PhDs in something. They all have been lifelong learners, but, you know, intense, lifelong learners, in one specific domain. So, I don't know, in five years, hopefully, I'm either in a Ph. D. Program, or I'm something an industry, or I'm doing something in the industry where I can then get a PhD program, get into a Ph. D. program, get a PhD.*

In this quote, we can observe that Rachel has exceptionally high standards and role models—she listens to the podcast of Lex Friedman. Elsewhere she reveals that she watches the YouTube channel of a psychologist, Andrew Huberman, and a Professor from SPU who has doctoral degrees from two different disciplines. According to her, the people whom she follows are "lifelong learners" and she doubts if she can achieve that level of expertise in her field. We observe Rachel's self-perceived deficits are partly due to the people she follows and role models around. While Rachel has high aspirations of getting admitted into a Ph.D. and inspiring role models, her ambitions and her role models' illustrious achievements cause her to self-doubt her ability to get admitted into a PhD program and to live up to being a "lifelong learner."

Dangers of a Story about Rachel's fears

We suggest the following as "dangers" of telling a single story representing Rachel's fears. First, this story may not accurately represent Rachel's feelings, life, and other perspectives because we, researchers, influenced her responses in the interview protocol. In the first interview, our interview protocol focused on Rachel's view of three different pathways in computing and her future career perceptions. This interview protocol likely unintentionally triggered Rachel's insecurities about her future and her lack of knowledge and abilities to get to her ambitious career destination. Her pronouncements of herself as lacking knowledge and abilities portray her as seemingly "less confident," yet her own knowledge about topics regarding her future—what is essential for admission to a Ph.D. position (research experiences, first author papers), what is essential to get a job (projects, money, time), and what it takes to be a lifelong learner (reading, reflection)—belie her self-doubt. While the text of her interview reads as a woman in computing lacking in confidence about her future, the subtext of the interview shows an ambitious and well-informed young woman striving towards a bright computing future.

Second, we must remember the power dynamics involved in interviewing a participant and question whether we, the researchers, have unintentionally created or made more likely the

response that we are analyzing. As researchers, we created the interview protocol, selected the people present during the interview, and decided how to represent their stories to others. By having multiple people in the Zoom room (although it was not intended to intimidate and was for training purposes), including some who may have more a more powerful positionality regarding Rachel specifically, we may have prompted her to reiterate her lack of knowledge relative to those she was talking to. If we want to create an accurate picture of Rachel, we should at least remind ourselves of the narrow contextual lens with which we allowed ourselves to meet her.

Third, we made choices regarding how to craft the story and what to emphasize. Adichie [1] highlights that power can make a story more definitive. When telling a story of marginalization or struggles, we may intend to present a sympathetic and not intend to portray a marginalized student as purely someone lacking in computing abilities due to various factors (for example: lack of self-efficacy). Still, this story ultimately is the researcher's story told about what the student lacks. Adichie [1] warns that this negative (deficit) story tends to flatten a subject's story and that we may overlook other stories that equally formed Rachel. This researcher's story fits a certain dominant narrative style—it appeals to certain audiences because it presents a student as having a worthy struggle or as a problem to solve. But having struggles and needs is one crucial part of human nature. We, as researchers, must also look at how prioritizing those struggles limits the story we tell.

A story about Rachel's assets

For the second interview, the lead author intentionally created a more open-ended interview protocol to delve into understanding Rachel's journey into the computing degree, her background, and her current experiences in the program. This protocol drew out more of Rachel's present confidence and strengths than the future-oriented Interview 1. When asked what made her choose computer science in the first place as a major at South East Public Community College (SPCC), a regional public community college, Rachel responded by saying,

> *What made me choose Computer Science was after like, I was [like], sure--"economics" [financial independence], then [I tried] computer engineering for one semester. And I took, I had the option to either take C for engineers or C, you know, normal C++, I also the difference was the way that C++ went more in-depth than I would have a greater like a deeper idea of, you know, the logic and, and you know, the foundations of CS. So I said, Okay, let me try that one. And if I, let's see how it goes. After I think, like a month in the course, I said, I want to continue doing. So then I just I find it, I changed my major to what it has been now for the past two to three years.*

Rachel agrees that one of her motivations to pursue computer science is "economics", that is, financial freedom after graduation. Still, she also likes to learn and gain a deeper understanding of programming languages contributing to her changing majors in her community college. The hope to attain financial freedom through her education can be understood as the aspirational capital [15] for her to persist and retain in her computing pathway. We observe that Rachel has the resources to help her sustain and survive in the computing degree. For example, when she was asked about her student communities outside of classrooms, she said,

> *However, since joining SPU, and not only the student community, but also like student organizations, and now that I'm in a leadership position, I do feel much more integrated. And I am happier with my space, I have more, I have a greater idea of the opportunities and the different pathways that I can choose from.*

Rachel had shared that she is a part of the Upsilon Pi Epsilon (UPE), a student community, during the first interview but we delved deeper into the second interview. Joining these student communities, Rachel feels "much more integrated" into the computing community. Rachel holds a leadership position in one of the teams and has access to various opportunities and pathways within computing through the people in these communities. This indicates that Rachel is building her social capital [15] to have a "greater idea" for different pathways she can choose from in her future. For instance, she shares her experience about being the team lead for an AI development team as follows:

> *So, this semester, I am the team lead for Upsilon Pi Epsilon Spark dev program. So Upsilon Pi Epsilon (UPE) essentially is like a student-led organization here at SPU. It's the largest one, we have many members, and its focus is on guiding new technologists within the technologies available in the industry and the opportunities available.*

Rachel feels very excited to have so many opportunities and structures to help her explore many opportunities based on her interest and having the right people to mentor and guide her into her journey after graduation.

From these quotes, as a transfer student, Rachel seems happy to have opportunities to build different capitals, for instance, cultural capital (education) and her social capital (networks), to explore different career pathways in future. Being a part of SSP also impacts her financial resources, that is, economic capital [15], which is an important reason why Rachel chose to pursue computing in the first place.

As mentioned, Rachel's aspirational capital stems from her dream to be financially independent, which is understandable given her background and economic status. During the interview she shared that she moved to the US from Venezuela and experienced some hardships, she poured all her aspirations into succeeding in school in order to have a more independent life. When asked about her motivation to stay in school, she shares,

> *I can't take this but my, so my only real escape was school. So I would be at school from morning to evening, like I took the last bus every time trying to get home.*
>
> *[contd] And because I was so unaware, because SPCC is not about a job or guiding you towards like, self-opportunities and more so just like here's classes that's it... let me give you an education even though you don't know what to do with it or where to go after this. So I put all my efforts into school. So my motivation was I don't know what I'm doing. The only thing that I know I can do here is school so I'm going to get everything's like squeeze the life out of this.*

This quote emphasizes where Rachel's aspirations to succeed come from. She says her motivation is that she "doesn't know what she's doing," and though she says it, she is excited to explore the educational opportunities. This quote, "squeeze the life out of this," also implies that she moved to the US and can only explore education in the US. Being at SPCC did not help her much in increasing her social, economic, and navigational capital. But transferring to a four-year university has allowed her to expand her cultural capitals [15] and is creating pathways for her to attain the financial independence that she had always imagined.

Dangers of a Story about Rachel's assets

In contrast to the fearful deficit story, the second story tells of Rachel's strengths, resources, and success. The analysis is similar to a version of viewing cultural capitals as assets analysis, where Rachel's present persistence is positioned as the success story and each piece that helped lead her there are categorized as cultural capitals as defined by Yosso [15]. Like the first story, a primary danger of the second story is that it may not be accurate to how the student is feeling about her life, including her family, background, her support systems in college, and her overall sense of achievement.

Although this story indeed saw Rachel detailing her assets, there were additional complications and context that helped us better understand Rachel beyond this simple one-dimension of analysis. Though we observe that Rachel feels happier with the number of resources that a university can offer concerning her future career and financial struggles, when asked what the motivation was for her to work hard in school, Rachel said that she stays in school most of her day to avoid her situation at home. The interview became very emotional at the end, and she was vulnerable with emotionally sensitive information about her familial situation. We left out that fuller context in the above story because we think in certain versions of assets storytelling, we avoid discussing students' points of pain and challenge or position all challenges as strengths (e.g., resistant capital).

We also note the fuller context of the interview interaction that creates the circumstances for this data to emerge. This time only the interviewer and the participant were present during the interview, and the lead author and Rachel had established some rapport with each other through their interactions at programmatic events. So, Rachel was probably feeling more confident to share her successes and strengths and more comfortable in sharing her vulnerable familial experiences. The interviewer/ lead author also draws inspiration from the second author's prior work with narrative agency [23] to create an interview dialogue that involves equal sharing by both researcher and participant. The interviewer shared her experiences in her previous computing studies and work. Thus, the researcher and interview context had a significant role in creating this encouraging and confident representation of Rachel. While this setting may have produced more warm and less guarded responses by Rachel, they cannot be considered a pure readout of Rachel's thoughts or persona as the interview context has significantly influenced the image of her, we perceive.

According to Adichie [1], glorifying the struggles of a community is patronizing and, hence, we still should be looking deeper within the stories that we are projecting to our communities. We as researchers have started moving away from the deficit story into asset stories of students thinking that it would benefit our understanding of their experiences. But in this counter-story, we can glorify the student's struggle instead of questioning the systemic inequities within these institutions. For example, not understanding Rachel's internal pressure to survive and persist in the computing degree might be harmful to students. Hence, understanding all the factors influencing a student's story, including their background, family, and other social factors are essential to understand their motivations/aspirations to pursue a degree.

Rachel's story

Having demonstrated the limitations of both the deficit/self-doubt and the asset/success stories, we now attempt to construct a story that is an honest account and does justice to Rachel's reality. We will try to present Rachel's story holistically by incorporating multiple different stories and contexts (Figure 1) and a balance of what we know from both interviews and outside context. In this version of the story, we tell about a student, we do our best to incorporate the student sense of self (story they tell about themselves), life circumstances, institutional factors, and the interview context and researcher-student interactions. We explore Rachel's story by including some of these factors accounted for in her story, such as her family and upbringing, her sense of self, her dreams, etc., This wider context is missing from the first and the second stories, since they are not necessary for telling a story about her lack of confidence in the future or her past and present success. The holistic story that might give us more insight into Rachel's story could look like this:

> Rachel's upbringing was admittedly challenging. In her words,
>
> *I lived in Venezuela for 4 to 5 years. My mom was deported when I was nine. That kind of created a rupture in my family. And to facilitate my dad's having to take care of three kids, me and my siblings, I moved to Venezuela to be with my mom. So I did my middle school, my high school over there. And you know, as the economic situation of Venezuela just kept worsening. I got an opportunity to come here to continue my education. And so I did.*
>
> Rachel came to the US thinking that her father and family would help support her to continue her education. When asked more about her family she shared,
>
> *When I moved [to the US], like, when I made the decision to come here, I expected for life to be much, you know, to have more independence, but also still have the support of my parents --of my dad and my siblings. But when I came here, it was not at all like that.*

I chose to go back [to college] because I can't take the lack of support, I can't take like the financial stress, I can't take being an outsider in my own home.

Although of course, Rachel's family supported her in some ways, she ultimately experienced their involvement as a deterrent to her educational development. She felt "an outsider" in her own home and with her family. Rachel shared that her motivation to go to college was,

So I put all my efforts into school. So my motivation was I don't know what I'm doing-- the only thing that I know I can do here is school so I'm going to get everything, like squeeze the life out of this. So yeah, that was my motivation: fear, stress and anxiety and honestly deep sorrow and depression.

In a complex and bittersweet way, the same experiences made Rachel feel like "an outsider" within her own family resulted in a sense of resistance and aspiration that motivated her to look for better opportunities at her community college, SPCC. She described that education was the only thing that could help her get closer to the independence that she wanted when she moved to the US. The quote highlighted her motivation to make something of herself, particularly because her family in the US had been unsupportive.

Rachel understood that education was the only thing that she could explore without much of her family's support and something that would make her financially independent in the future. She joined SPCC, and pursued computer science. When asked why she chose computer science, she shared,

What made me choose Computer Science was after like, I was [like] sure—"economics" [financial independence]—then [I tried] computer engineering for one semester. And I took, I had the option to either take C for engineers or C, you know, normal C++, I also the difference was the way that C++ went more in depth than I would have a greater like a deeper idea of, you know, the logic and, and you know, the foundations of CS. So I said, Okay, let me try that one. And if I, let's see how it goes. After I think, like a month in the course, I said, I want to continue doing. So then I just I find it, I changed my major to what it has been now for the past two to three years.

In this quote, Rachel agreed that she joined computer science because of "economics", which is the financial guarantee after completing the degree, which made sense given lack of familial support for her. She also mentioned that she had the opportunity to take courses in computer engineering like C for engineers or C++. She wanted to gain a deeper understanding of these programming languages, which was the foundations for a degree in computing. Rachel understands what can help her better if she were to pursue a

career in computing even from a community college perspective. In another instance, she also expressed that SPCC only gave her an academic education and no other opportunities to explore computer science. So, she wanted to transfer to a four-year university.

Now in the present, Rachel navigates the ecosystem of her computing department at SPU, which she described as follows:

Since joining SPU, and not only the student community, but also like student organizations, and now that I'm in a leadership position, I do feel much more integrated. And I am happier with my space, I have more, I have a greater idea of the opportunities and the different pathways that I can choose from.

Rachel was not exposed to many different opportunities for her future career at SPCC did not have a large student community network or student organizations. Now with access to these opportunities at SPU, she is gaining confidence, feeling happier, and feeling more integrated with the student community. Although she successfully navigates her present, she continues to have fears about how she'll handle the future; for instance, she shared,

I feel like I've been in school for much too long and I have too few classes too little knowledge under my belt to actually say that I know anything. The social games like all the hoops and loops and things that we need to jump through to get interviews or or get into, yeah, mainly get into it's like how do you get a job? You need to have projects, okay, how do you get projects, if you need money, and you don't have time? Well, you work and then you don't have time to do projects and then studying is difficult and then school takes up a lot of your time. As a student I feel overwhelmed with choices and decisions that I don't know how they will impact my life because I don't have enough experience to make these choices or decisions. So, I feel overwhelmed and lost.

Though she feels "overwhelmed and lost", Rachel demonstrates significant knowledge for navigating "the social games" to get through interviews and jobs. Perhaps she has knowledge of so many future pathway opportunities and is inspired by so many famous success stories (Elon Musk, Mark Zuckerburg), that she senses herself as quite far behind. This sense of being behind doesn't seem to define Rachel, but we can imagine her sometimes needing help from a friend or mentor to remind her not to compare herself to these singular outlier success stories or to get caught in a logic loop of what she lacks.

When reminded about how far Rachel had come to the point she's at now, she remembered her many resources and skills that she had learnt through these experiences. When asked which of three career pathways she might choose in the future, she responded,

I have no idea of what my life could be like, at least I'll have an idea of what my life could be like [in] graduate school, but it would enrich my career because I would know how to do everything that I want to do. And if I don't know how to do this thing that I want to do, I know that I can learn it very simply, I know that I have a network of people that okay, if I don't know what I need to do to get there, I can contact someone or I can look it up online, I can find a way to learn, but at least I know I have that foundation, so that I can get there. I think continuing education will teach me how to learn and will give me a wider foundation. So I'll be able to do whatever it is that I want to do.

While still acknowledging her uncertainty about her future, Rachel points out her skills and "network of people" that she gained through this journey from Venezuela via SPCC to the present at SPU. She knew that she could "contact someone" or "find a way to learn" if she could continue getting her education and that it would give her a "wider foundation" to do whatever it was she wanted to do. These skills and network are evidence of the cultural and social capital [15] that she is acquiring as she navigates through these experiences within her computing degree.

Why does this story matter?

The third story engages Rachel in many different stories: her struggles, her achievements, her fears and so on. While it is easy to simplify Rachel into a one-dimensional story (e.g.: deficit and asset stories), ultimately, she is both marginalized and inspiring.

Adichie [1] says, "it is impossible to engage properly with a place or a person without engaging with all of the stories of that place and that person. The consequence of the single story is this: It robs people of dignity. It makes our recognition of our equal humanity difficult. Hence, viewing different dimensions of Rachel in the third story engages Rachel as more human than just a student in a learning environment. Engaging with all of Rachel's qualities will make the story more relatable to our own home ground[1] and more believable.

As researchers, though we do not intend to portray a student as someone less capable of computing abilities or glorifying their struggles, these stories can end up being told from one dimension. However, we have power to engage with either one-dimensional stories or more holistic stories of participants to share them with the world. Whichever story we choose to share will become a part of the prevailing narratives in practice. Hence, understanding that having certain deficits and assets are part of human nature, we as researchers should consider viewing them alongside each other and other dimensions too. Learning to meet students like Rachel

[1] *home ground – a sports team's own ground, which is used for their home games; a place where one feels familiar.*

where they are and resisting the simpler stories that we may be inclined to tell helps us do more justice to them and their realities and find better means of supporting them.

Concluding Thoughts

One of the primary contributions of this paper is trying to find ways to meet the student where they are instead of recording and categorizing the factors influencing their participation. As existing stories mention the importance looking beyond the institutional factor that impact women's participation and retention in computing [6], [7], this paper contributes to start having those conversations within the scholarly community. With many efforts to increase participation in the computing learning community, we moved away from understanding the factors impacting the underrepresentation of women, which also mostly came from a deficit-based perspective (for example, geek culture, lack of self-efficacy). To promote a better understanding of how women navigate within their undergraduate computing education, we sought to understand their experiences and label them persisting despite facing certain challenges [16], [17]. We hope that by presenting three different stories of the same person, we can understand there are ways to holistically represent a participant's story including their assets and deficits, and success and failures. They do not have to be just lacking self-efficacy or just acquiring capitals, but they can be both and it is okay to have both qualities in them.

Like Adichie, travelling and experiencing other places, people and cultures helped me realize that there is no one true story. There will always be some context, background and other information being left out from the existing stories. Similarly, though we have attempted to explore the dangers of different existing story viewpoints present in the computing learning environments, and present you with a holistic third story, our story is of course incomplete. We, too, have limited knowledge and have missed some other important context and mitigating factors from Rachel's life. As each scholar makes choices about what context to incorporate when telling the holistic and balanced story within their study's bandwidth, our paper may provide a thought experiment and cautionary tale for what can happen when that nuance and balance gets reduced in favor of some simpler and more advantageous story.

The stories we tell as researchers matter. Although we have emphasized the dangers from a researcher's perspective, we should also consider what these stories might mean for the participants if and when we retell them. A story about fears could help the student process those realities, a story about persistence could function as pep talk, and an honest story likely does more justice to their lived reality. Each of the stories could matter to the student at some time, but we maybe need to question what and when and how we retell. A story that does not do justice to a participant's realities can leave a student feeling at best, misrepresented, at worst, used. Understanding our students' stories as told from their perspectives and meeting them where they are in creating our responses is essential to create educational cultures that will broaden participation in computing.

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